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(54) **APPARATUS AND METHOD FOR MAKING A WRAPPABLE PACKAGING PRODUCT**

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(52) **U.S. Cl.**
CPC **B31D 5/0069** (2013.01)

(58) **Field of Classification Search**
USPC 493/464, 459, 407, 350, 352, 967
See application file for complete search history.

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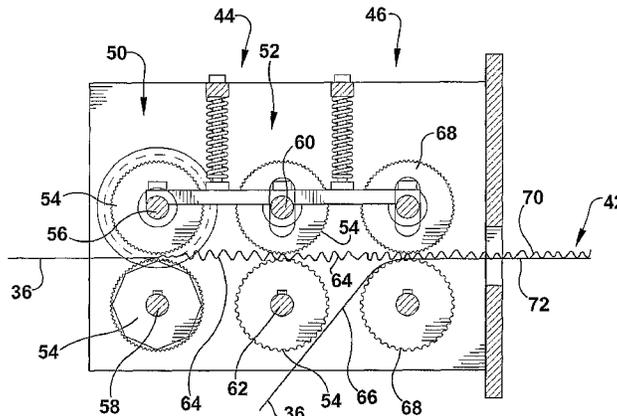
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(57) **ABSTRACT**

A packaging system (10) includes a supply (12) of stock material (14) having a cohesive on a surface thereof and an apparatus (16) for converting the stock material (14) into a packaging product (20). The apparatus (16) includes at least one crumpling assembly (22) that can advance stock material (14) from the supply (12) and can cause the stock material (14) to randomly crumple. The apparatus (16) also includes a joining assembly (24) that can bring the crumpled stock material (26) together with uncrumpled stock material (28). The crumpled stock material (26) and the uncrumpled stock material (28) each have a cohesive on at least a portion of mutually facing surfaces such that the cohesive portions on those surfaces bond together when they come into contact with each other, thereby securing the crumpled stock material (26) to the uncrumpled stock material (28).

6 Claims, 5 Drawing Sheets



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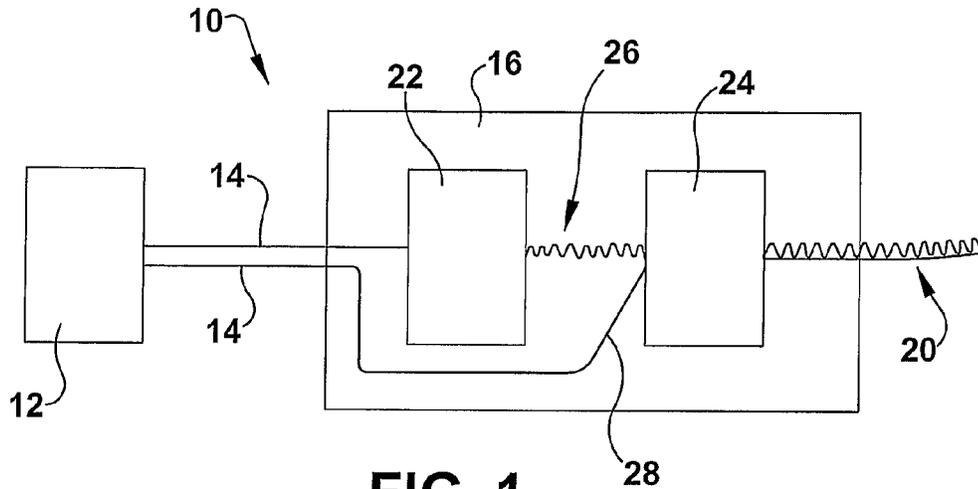


FIG. 1

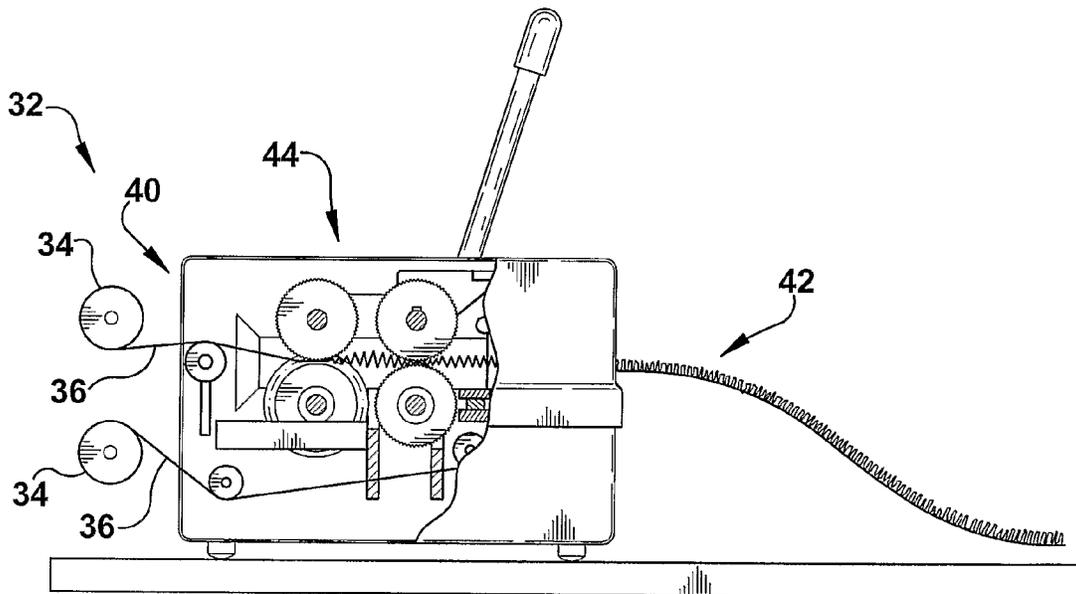


FIG. 2

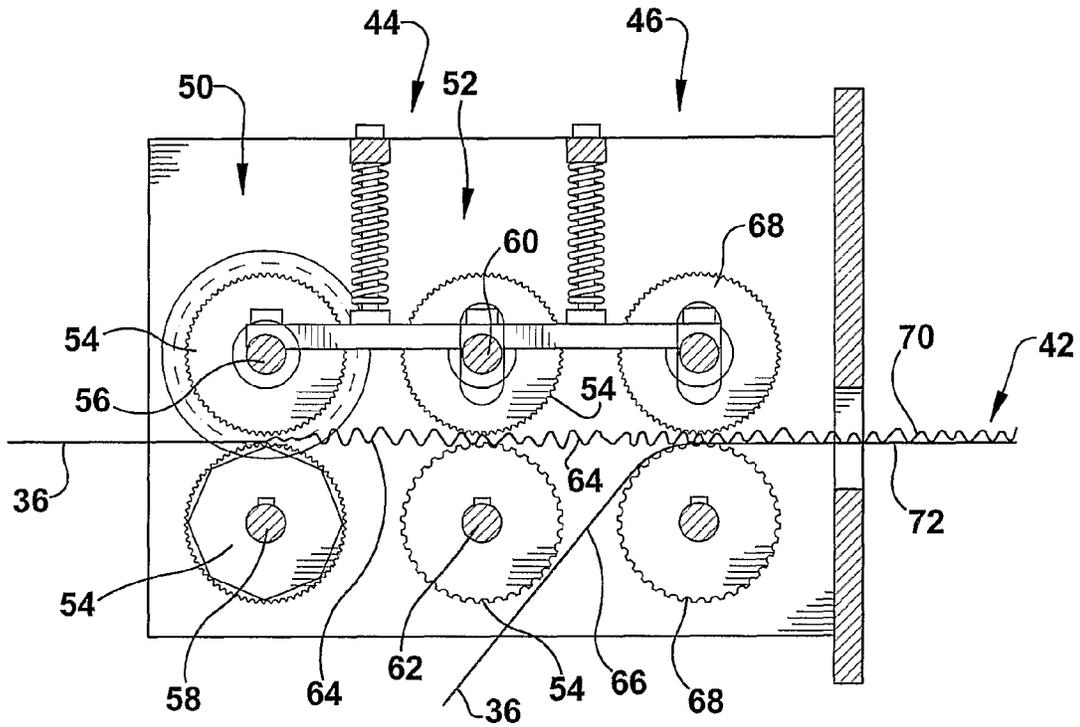


FIG. 3

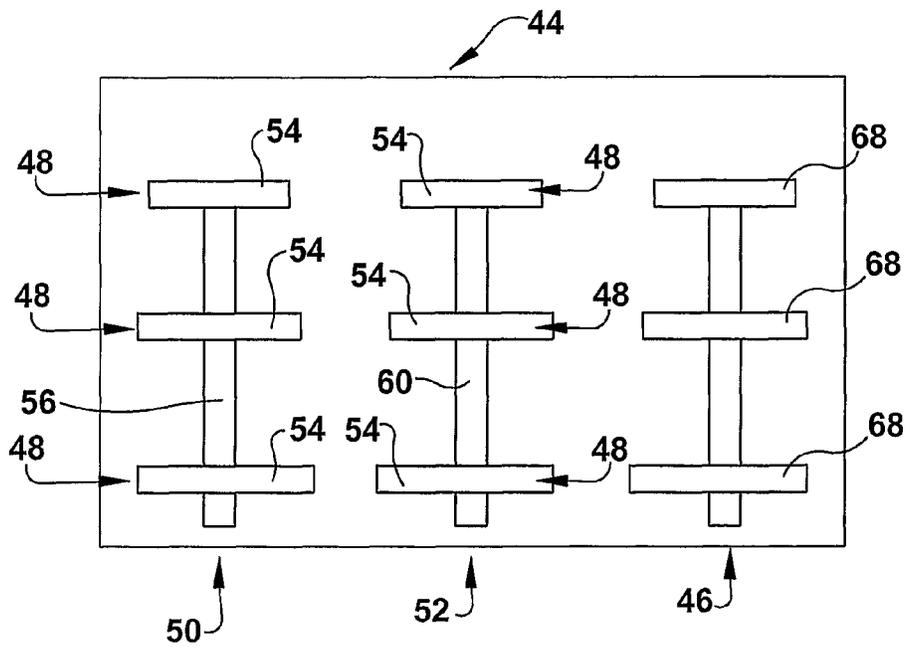


FIG. 4

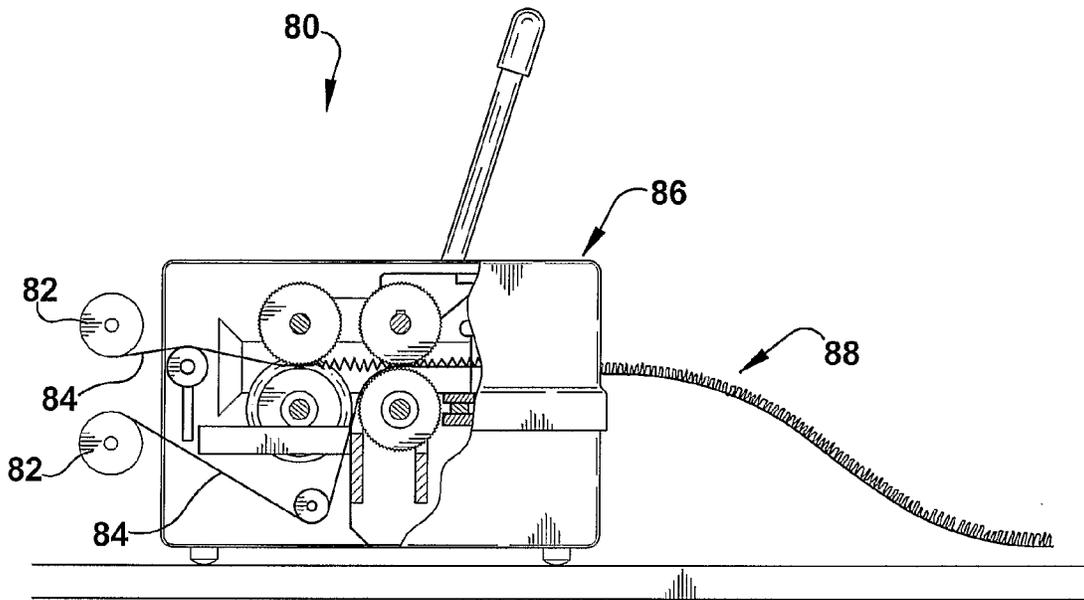


FIG. 5

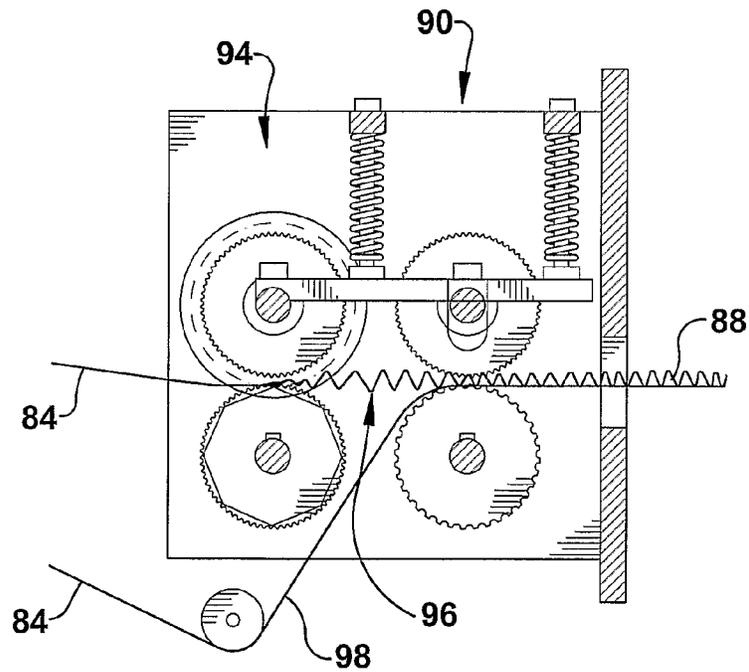


FIG. 6

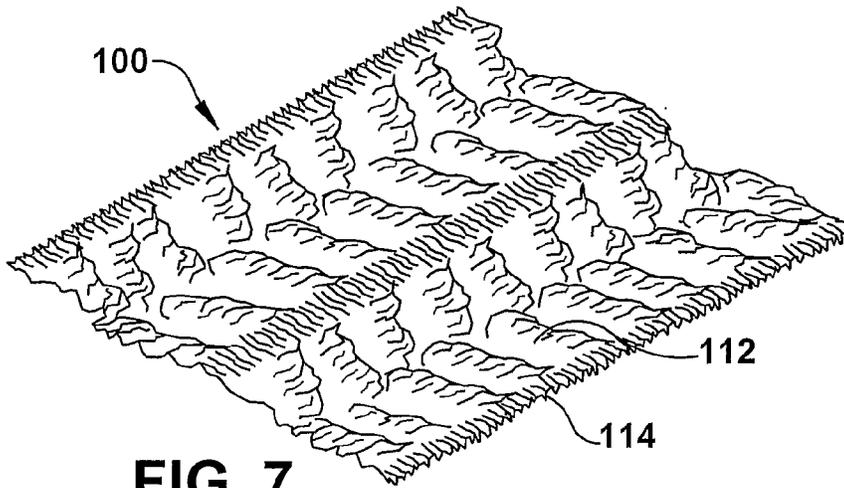


FIG. 7

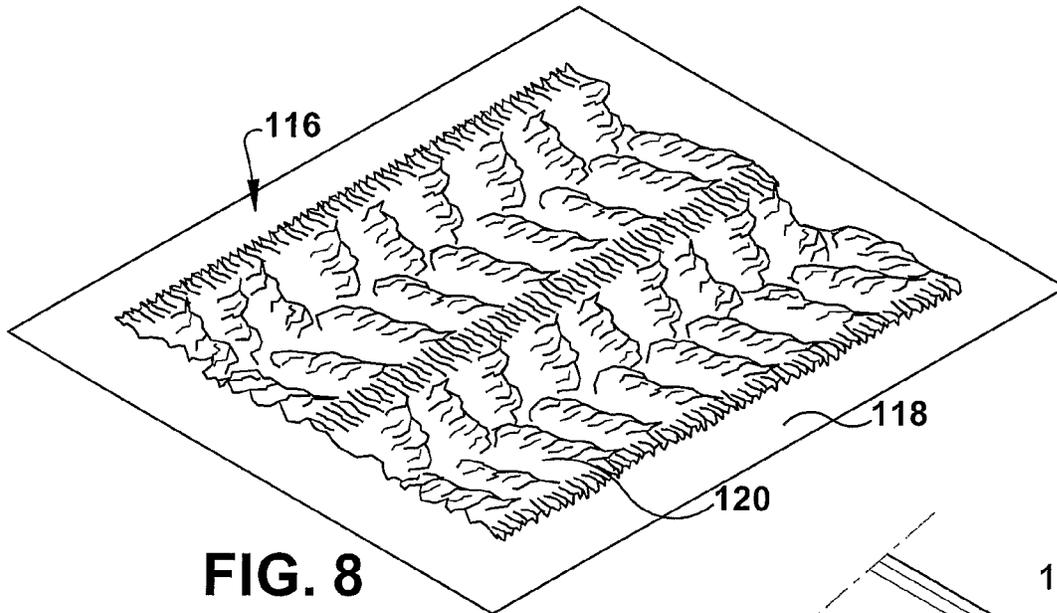


FIG. 8

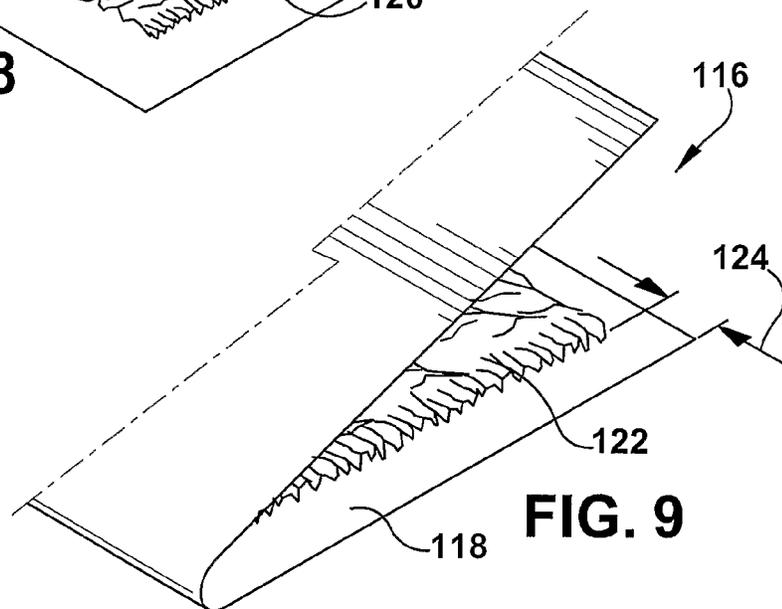


FIG. 9

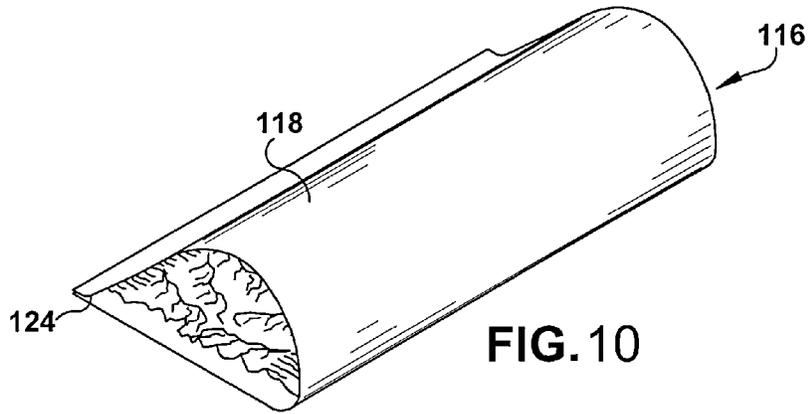


FIG. 10

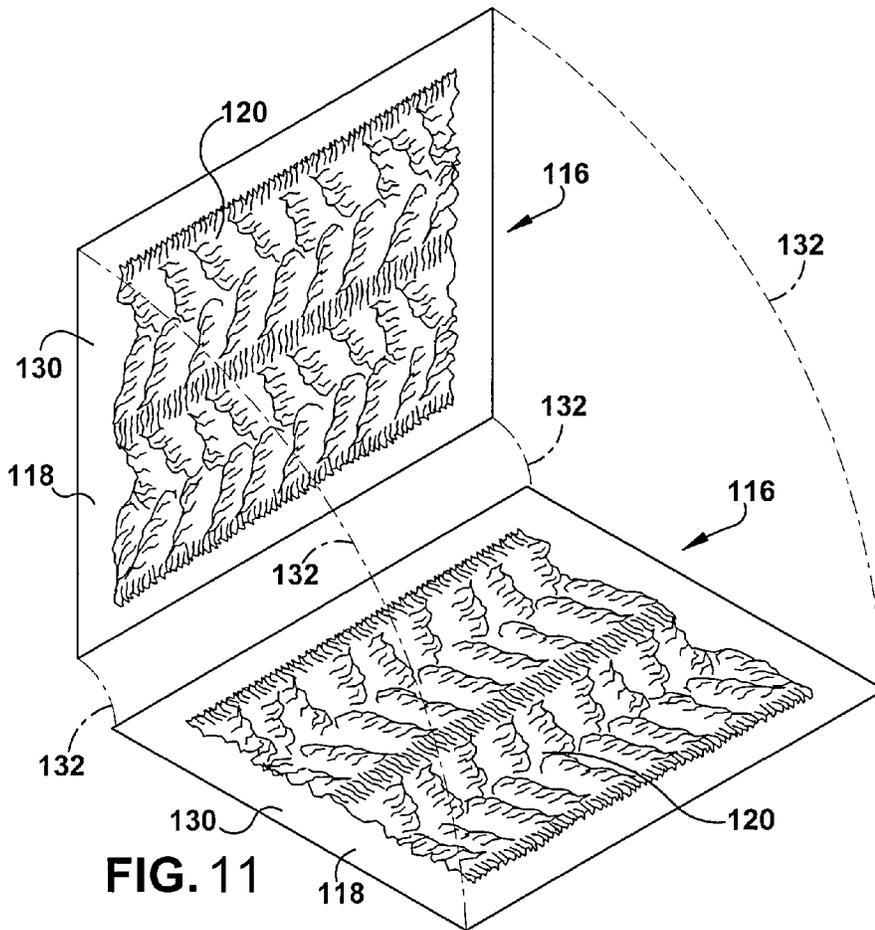


FIG. 11

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APPARATUS AND METHOD FOR MAKING A WRAPPABLE PACKAGING PRODUCT

This application claims the benefit of International Patent Application No. PCT/US2006/002786, filed Jan. 26, 2006, published in English as Publication No. WO 2006/081356 A1, which claims the benefit of U.S. Provisional Application No. 60/647,114, filed Jan. 26, 2005, both of which are hereby incorporated herein.

FIELD OF THE INVENTION

This invention relates generally to a packaging system and method, and more particularly to a packaging system and method using a stock material having a cohesive on a surface thereof to form a wrappable packaging product.

BACKGROUND

In the process of transporting an article from one location to another a protective packaging material typically is placed in a container around the article to fill any voids or to cushion the article or both during the transportation process.

One type of cushioning protective packaging material is disclosed in U.S. Pat. No. 5,558,923, and includes superimposed paper courses that form a package padding material. The padding includes a pleated course bounded by a pair of courses mechanically joined to the pleated course by punchings therethrough. Such a package padding material can be used as a cushion or a wrap or void fill.

Another cushioning protective packaging material is disclosed in U.S. Pat. No. 6,017,299 which advances a sheet stock material through a series of assemblies that cooperate to crumple the stock material with an arrangement of folds that can form a herringbone pattern. This cushioning product is relatively flat and has the flexibility to wrap around an object, yet still functions to cushion and/or protect the object.

SUMMARY

The present invention provides a packaging system and method using a stock material having a cohesive on at least one surface thereof to form a packaging product. The packaging product comprises a first layer of randomly crumpled stock material and a second layer of uncrumpled stock material, wherein the first layer and the second layer are attached to each other by a cohesive disposed on at least a portion of each of mutually facing surfaces of the first layer and the second layer.

More particularly, the present invention provides an apparatus for converting a stock material into a packaging product comprising at least one crumpling assembly that can advance a stock material and cause the stock material to randomly crumple, and a joining assembly that can bring the crumpled stock material together with uncrumpled stock material. The crumpled stock material and the uncrumpled stock material each have a cohesive on at least a portion of mutually facing surfaces to secure the crumpled stock material to the uncrumpled stock material.

The present invention also provides a method of making a packaging product that includes the steps of: randomly crumpling a stock material having a cohesive material on at least one surface thereof, and attaching the crumpled stock material and an uncrumpled sheet stock material, each having a cohesive material on at least one surface. The crumpled stock material and the uncrumpled stock material are attached by bringing at least one cohesive portion of the crumpled stock

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material together with at least one corresponding cohesive portion of the uncrumpled stock material.

The present invention also provides a packaging product produced by a process that includes the following steps: randomly crumpling a stock material having a cohesive material on at least one surface thereof to form a crumpled stock material, and combining the crumpled stock material with an uncrumpled stock material having a cohesive material on at least one surface thereof by bringing the respective cohesive portions together.

The foregoing and other features of the invention are hereinafter fully described and particularly pointed out in the claims. The following description and annexed drawings set forth in detail certain illustrative embodiments of the invention, these embodiments being indicative, however, of but a few of the various ways in which the principles of the invention can be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a system in accordance with the present invention.

FIG. 2 is a side view of an exemplary packaging system in accordance with the present invention with a portion of a housing removed to show components of the various assemblies of an apparatus.

FIG. 3 is an enlarged side view of the assemblies of the apparatus of FIG. 2.

FIG. 4 is a schematic plan view of the apparatus of FIG. 3.

FIG. 5 is a side view of another exemplary packaging system in accordance with the present invention with a portion of a housing removed to show components of the various assemblies of an apparatus.

FIG. 6 is an enlarged side view of the assemblies of the apparatus of FIG. 5.

FIG. 7 is a perspective view of a packaging product in accordance with the present invention.

FIG. 8 is a perspective view of another packaging product in accordance with the present invention.

FIG. 9 is a perspective view of the packaging product of FIG. 8 partially folded along a transverse axis.

FIG. 10 is a perspective view of the packaging product of FIG. 8 folded along longitudinal axes.

FIG. 11 is a perspective view of another packaging product in accordance with the present invention.

DETAILED DESCRIPTION

The present invention provides a packaging system and method for making a packaging product from a stock material having a cohesive on at least one surface thereof. The cohesive provides benefits in converting the stock material into a packaging product, using the packaging product to wrap or otherwise pack one or more articles, or enhances one or more properties of the packaging product to provide different performance characteristics in comparison to a packaging product without the cohesive material.

Referring initially to FIG. 1, an exemplary packaging system 10 in accordance with the present invention includes a supply 12 of stock material 14 having a cohesive on a surface thereof and an apparatus 16 for converting the stock material 14 into a packaging product 20. The apparatus 16 includes at least one crumpling assembly 22 that can advance stock material 14 from the supply 12 thereof and cause the stock material 14 to randomly crumple. The apparatus 16 also includes a joining assembly 24 that can bring the crumpled stock material 26 together with uncrumpled stock material

28. The crumpled stock material **26** and the uncrumpled stock material **28** each have a cohesive on at least a portion of mutually facing surfaces that bond together when they come into contact with each other, thereby securing the crumpled stock material **26** to the uncrumpled stock material **28**.

The supply of stock material **12** generally includes a sheet stock material, such as paper or plastic, having one or more plies, with a cohesive on a surface of at least one ply. The stock material can be provided as a continuous roll or fan-folded stack, or as discrete sheets. A cohesive, unlike an adhesive, only attaches to itself and generally will not stick to other items, such as non-cohesive-coated portions of the stock material or a converting apparatus. No heat or supplementary closure materials, such as adhesive glue, mechanical staples, tape or other bonding strips, for example, are necessary to hold the crumpled and uncrumpled stock material together in view of the cohesive.

The cohesive on the stock material can stiffen the stock material and the resulting packaging product and can increase its strength. The cohesive can be selected to enhance one or more properties in the packaging product, however, such as the aforementioned stiffness of the packaging product or portion of the packaging product, enhanced strength, etc. The cohesive also can provide benefits in the use of the resulting packaging product, such as to hold multiple packaging products or portions thereof together in a particular orientation, such as a pouch.

Turning to FIGS. 2-4, an exemplary embodiment of a system **32** in accordance with the present invention includes a supply of stock material, such as rolls **34** of continuous sheet stock material **36** and an apparatus **40** for converting the stock material **36** into a packaging product **42**. The apparatus **40** includes a crumpling assembly **44** and a joining assembly **46**. In the embodiment shown in FIGS. 2-4 the crumpling assembly **44** includes a first assembly **50** to feed the stock material **36** therethrough at a first rate and a longitudinally-spaced second assembly **52** to feed the stock material **36** therethrough at a second rate that is slower than the first rate. This difference in feed rates causes longitudinal crumpling in the stock material **36**. The crumpling assembly **44** also can laterally crumple the stock material **36**, thereby reducing the lateral dimension of the crumpled stock material **36**. The illustrated crumpling assembly **44** includes a plurality of laterally-spaced crumpling assemblies that cooperate to cause longitudinal or longitudinal and lateral crumpling in the stock material **36**.

Both the crumpling assembly **44** and the joining assembly **46** generally include laterally-spaced pairs of rotating members **54** that cooperate to crumple, advance, and join the stock material therebetween. To cause the lateral crumpling mentioned above, respective laterally outer pairs of rotating members **54** can include a staggered arrangement of flat faces on the rotating members that will cause the stock material to be advanced alternately from each side of its longitudinal axis, instead of being pulled only axially. This advance by successive pulls from one side and then the other side back and forth makes it possible to have at the center of the stock material a surplus of stock material with respect to its flat sheet configuration, this surplus being generated by a rib on one rotating member fitting in a mating groove in an opposing rotating member of the pair. This results in lateral crumpling of the stock material.

With particular reference to FIGS. 3 and 4, the first assembly **50** includes three laterally-spaced crumpling assemblies **48** mounted to a pair of rotatable shafts **56, 58**. The second assembly **52** includes three laterally-spaced crumpling assemblies **48** downstream of the first crumpling assembly **50**

mounted to another pair of rotatable shafts **60, 62**. The first assembly **50** is configured to advance the stock material **36** drawn from the supply **34** at a first rate, and the second assembly **52** is configured to advance the stock material at a second rate that is slower than the rate of the first assembly **50**. The stock material **36** randomly crumples as it gathers behind the slower-advancing second assembly **50**. This crumpling tends to reduce the longitudinal and transverse dimensions of the stock material **36** and cohesive portions that come into contact with one another as the stock material crumples bind together and thereby help the crumpled stock material maintain is crumpled state.

The joining assembly **46**, located proximate the downstream end of the crumpling assembly **44**, brings the crumpled stock material **64** together with uncrumpled stock material **66**. Similar to the crumpling assembly **44**, the joining assembly **46** generally includes upper and lower pairs of rotating members **68** configured to advance the stock material therebetween. The joining assembly **46** is configured to compressively engage the crumpled stock material with the uncrumpled stock material, pressing together respective cohesive portions of the crumpled and uncrumpled stock material, whereupon the cohesive portions become bound together and thereby secure the crumpled stock material **64** to the uncrumpled stock material **66**.

The resulting packaging product **42** generally includes a first layer of randomly crumpled stock material **70** attached by the respective cohesive portions to a second layer of uncrumpled stock material **72**. The uncrumpled stock material thus secured to the crumpled stock material tends to hold the uncrumpled stock material in its crumpled state. The crumpled stock material can be secured to the uncrumpled stock material in any suitable orientation. For example, the crumpled stock material can be centered on the uncrumpled stock material or offset such that at least one laterally outer edge of the uncrumpled stock material extends beyond a respective laterally outer edge of the crumpled stock material. As noted below, the crumpled stock material, for example, can be free of cohesive in some applications.

Turning to FIGS. 5 and 6, another exemplary system **80** in accordance with the present invention is shown. This system **80** also includes a supply **82** of stock material **84** and an apparatus **86** for converting the stock material **84** into a packaging product **88**. The apparatus **86** is similar to the apparatus **40** of FIG. 3. In this embodiment, however, the downstream crumpling assembly **90** also is the joining assembly. Thus, the downstream or second assembly **90** advances the stock material **84** at a slower rate than the upstream assembly **94**, thereby causing the stock material to crumple upstream thereof. At the same time, the downstream assembly **90** brings the crumpled stock material **96** together with uncrumpled stock material **98** so that respective cohesive portions on each stock material bind together to form the packaging product **88**.

Turning to FIG. 7, as noted above a packaging product **110** in accordance with the present invention includes a first layer **112** of randomly crumpled stock material superimposed over and attached to a second layer **114** of uncrumpled stock material via a cohesive. The crumpled layer is coextensive with the uncrumpled stock material such that the lateral edge portions of each layer are generally aligned.

In FIGS. 8 and 9, a packaging product **116** in accordance with the present invention is shown wherein at least one laterally outer edge of a layer **118** of uncrumpled stock material extends beyond a respective laterally outer edge of a layer **120** of crumpled stock material. In this embodiment, the exposed edge of the uncrumpled stock material can include a cohesive on at least a portion of its surface. Typically the

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uncrumpled stock material and the crumpled stock material have cohesive over an entire surface, although for some applications cohesive can be omitted from the crumpled stock material. The cohesive on the exposed edge of the uncrumpled stock layer 118 can be used to secure the packaging product in a desired configuration after the packaging is manipulated into a desired position by bringing cohesive portions of the uncrumpled material together.

For example, as shown in FIG. 9, the packaging product 116 of FIG. 8 in accordance with the present invention can be folded along a transverse axis to bring laterally exposed cohesive portions 124 of the packaging product into engagement with one another. It will be appreciated that an article to be packaged can be placed on an unfolded sheet of the packaging product prior to folding the packaging product over. Once the packaging product is folded over and the laterally exposed cohesive portions 124 of the packaging product engage and bond to each other, the article is generally secured within a pouch formed by the folded packaging product. This is one of the situations where the cohesive on the uncrumpled stock material holds the package together, so cohesive is not necessary on the crumpled stock material. The article also can be placed in the pouch after the packaging product is folded.

Similarly, in FIG. 10 the packaging product 116 of FIG. 8 is folded along a longitudinal axis bringing opposing laterally-exposed edge portions 124 of the uncrumpled layer 118 into contact to form an open-ended enclosure. Conceivably, the packaging product 116 also could be rolled into a tubular or conical shape. If cohesive portions are provided on the ends as well, the ends of such a packaging product could be sealed with the article enclosed within.

A pouch or other enclosure also could be formed from multiple sections of the packaging product 116 of FIG. 8, as shown in FIG. 11. The packaging product of FIG. 11 includes an exposed perimeter region 130 of the uncrumpled layer 118 having cohesive on at least a portion thereof. These sections of packaging product 116 can be used to form a sealed pouch by bringing the exposed cohesive portions in the perimeter region 130 of respective sheets 116 together to bond with each other, as shown by the arrows 132. For example, two sections can be used to sandwich an article to be shipped therebetween, wherein cohesive portions in the perimeter region 130 of the uncrumpled layer 118 of the stock material of each section are aligned and attached to respective cohesive portions in the perimeter regions 130 thereby sealing the article between the two sections.

As another alternative, a single ply of cohesive stock material can be used to form a dunnage product. The cohesive in this instance is placed on a surface of the stock material such that upon randomly crumpling the stock material different portions of the stock material having cohesive thereon come together, whereupon the cohesive portions bind together to hold the stock material in its crumpled state.

As should be apparent by now, the cohesive can be applied to the stock material in any manner that facilitates the conversion process or provides desired qualities in the resulting packaging product. The cohesive generally is placed on a surface of the stock material such that upon crumpling different portions of cohesive can be brought together whereupon they bind together to secure the crumpled stock material in its crumpled state. Alternatively, the cohesive can be applied to an uncrumpled stock material whereby the cohesive portions can be brought together to entrap a cohesive-free crumpled stock material and an article therebetween. A wide variety of arrangements of cohesive on the stock material are possible. The cohesive can be provided across an entire surface of the stock material or strategically applied in regularly or irregu-

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larly spaced, sized, oriented or shaped strips or patterns of cohesive on one or more surfaces of the stock material.

The present invention thus provides a system and method using a cohesive stock material to make and use the improved packaging product of the present invention. The cohesive can improve characteristics of the packaging product, help to maintain the crumpled stock material in its crumpled state, or help to maintain a configuration of the packaging product relative to itself or other packaging or dunnage products.

Although the invention has been shown and described with respect to certain illustrated embodiments, equivalent alterations and modifications will occur to others skilled in the art upon reading and understanding the specification and the annexed drawings. In particular regard to the various functions performed by the above described integers (components, assemblies, devices, compositions, etc.), the terms (including a reference to a "means") used to describe such integers are intended to correspond, unless otherwise indicated, to any integer that performs the specified function (i.e., that is functionally equivalent), even though not structurally equivalent to the disclosed structure that performs the function in the herein illustrated embodiments of the invention. In addition, while a particular feature of the invention might have been described above with respect to only one of several illustrated embodiments, such a feature can be combined with one or more other features of another embodiment, as might be desired and advantageous for any given or particular application.

What is claimed:

1. An apparatus for converting a stock material into a packaging product, comprising:
 - a supply of sheet stock material having first and second plies, each ply having a cohesive on at least a portion of at least one face;
 - at least one crumpling assembly downstream of the supply that can advance the first ply of sheet stock material and cause the first ply of sheet stock material to randomly crumple; and
 - a joining assembly at a downstream end of the crumpling assembly that can bring the crumpled first ply of sheet stock material together with the second ply of sheet stock material, the joining assembly bringing the cohesive faces of the crumpled first ply of sheet stock material and the second ply of sheet stock material together to secure the crumpled first ply of sheet stock material to the second ply of sheet stock material.
2. An apparatus as set forth in claim 1, wherein the crumpling assembly includes a plurality of laterally spaced crumpling assemblies that cooperate to cause longitudinal and lateral crumpling in the stock material.
3. An apparatus as set forth in claim 1, wherein the at least one crumpling assembly includes a first assembly to feed the stock material therethrough at a first rate and a longitudinally spaced second assembly to feed the stock material therethrough at a second rate that is slower than the first rate, thereby causing longitudinal crumpling in the stock material.
4. An apparatus as set forth in claim 3, wherein the longitudinally spaced second assembly is the joining assembly that can bring the crumpled first ply of sheet stock material together with the second ply of sheet-stock material.
5. An apparatus as set forth in claim 1, wherein the joining assembly can bring the crumpled first ply of sheet stock material together with the second ply of sheet stock material such that at least one laterally outer edge of the second ply of sheet stock material extends beyond a respective laterally outer edge of the crumpled first ply of sheet stock material.

6. An apparatus as set forth in claim 1, wherein the crumpling assembly can laterally crumple the first ply of sheet stock material thereby reducing the lateral dimension of the crumpled first ply of sheet stock material.

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